

REMARKS

Applicants appreciate the Examiner's thorough consideration provided the present application. Claims 1, 2, 4, 6-10, and 12-16 are now present in the application. Claims 1 and 9 are independent. Claim 5 has been cancelled. Claims 1, 9 and 10 have been amended. Reconsideration of this application, as amended, is respectfully requested.

Drawings

Applicants appreciate the Examiner's indication that the drawings filed on December 28, 2001 have been accepted.

Claim Rejections Under 35 U.S.C. § 103

Claims 1, 2 and 4-6

Claims 1, 2 and 4-6 (and possibly claim 15) stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,055,035 to von Gutfeld et al. (von Gutfeld) in view of Gyoda. This rejection is respectfully traversed.

A complete discussion of the Examiner's rejection is set forth in the Office Action, and is not being repeated here. In addition, claim 5 has been cancelled, thereby rendering the rejection thereof moot.

In light of the foregoing amendments to the claims, Applicants respectfully submit that this rejection has been obviated and/or rendered moot. While not conceding to the appropriateness of the Examiner's rejection, but merely to expedite prosecution, as the Examiner will note, independent claim 1 has been

amended to recite a combination of steps in a method of forming a liquid crystal layer including applying a vibration and pressure to the projecting portion so as to emit the liquid crystal material simultaneously from the plurality of orifices, said vibration being generated from a resonator overlapping the plurality of orifices. Applicants respectfully submit that the combinations of steps as set forth in amended independent claim 1 is not disclosed or suggested by the prior art of record, including von Gutfeld and Gyoda.

In making this rejection, the Office Action asserts that von Gutfeld discloses a method of forming a liquid crystal layer on a substrate that is basically the same as the method recited in claim 1, except for applying a vibration and pressure to the projecting portion to emit the liquid crystal material from the projecting portion. To supply the deficiency, the Office Action cites Gyoda, asserting that Gyoda teaches applying a vibration and pressure to a projecting portion 50 (ink-jet nozzle) through a vibrator 52 so as to emit a liquid crystal material 61 from the projecting portion.

Further, the Office Action states that it would have been obvious to one having ordinary skill in the art to modify the method of forming a liquid crystal layer on a substrate of von Gutfeld with the teaching of Gyoda by employing the ink-jet application method for applying a vibration and pressure to the projection portion to discharge the liquid crystal material with high accuracy.

The Applicants submit that Gyoda cannot supply the deficiency of von Gutfeld. Particularly, Gyoda does not teach said vibration being generated from a resonator overlapping the plurality of orifices.

The Office Action (on page 4) provides that “the vibration is generated by a voltage applied to a resonator 59”. In other words, the Office Action equates a piezoelectric element 59 of Gyoda with the resonator of the Applicants’ claimed invention. However, piezoelectric element 59 (the asserted resonator), shown in Figs. 6 and 7, does not overlap a plurality of orifices. Otherwise, the ink-jet nozzle of Gyoda could not function as intended.

In Gyoda, pluralities of volumes of space 54 are provided, each holding a particular volume of liquid crystal. An orifice (nozzle aperture 57) is provided in each volume of space to discharge a droplet of the liquid crystal. A single plate 52 (vibrator plate) is disposed above the plurality of volumes of space 54. In order to discharge a droplet of liquid, the piezoelectric element 59 deforms outwardly to receive a quantity of liquid crystal, and then deforms inwardly in order to discharge the droplet of liquid crystal. A separate piezoelectric element is provided above each volume of space 54. In operation, the piezoelectric element 59 is deformed when a voltage is applied to a pair of electrodes 60, between which the piezoelectric element 59 is interposed. When the piezoelectric element is deformed, a portion of vibrator plate 52 is also deformed. When the piezoelectric element 59 is restored, a portion of the vibrator plate 52 is also restored. It is this action of deformation and restoration that “pumps” out a metered droplet of liquid crystal through the orifice (nozzle aperture 57) of Gyoda. A complete discussion of the operation described in this paragraph is provided in Gyoda, paragraph [0109].

Of note here is that Gyoda requires a plurality of piezoelectric elements 59 (the asserted resonator) and electrodes 60 for the method disclosed therein. There

is one arrangement of elements 59 and electrodes 60 for each volume space 54 in the ink-jet nozzle 50 of Gyoda. If the asserted resonator (piezoelectric element 59) of Gyoda were made to overlap more than one orifice, the ink-jet nozzle would no longer function as intended.

For the reasons explained above, von Gutfeld, in view of Gyoda fails to teach or suggest the combination of steps as recited in independent claim 1, as amended. Claims 2, 4, 6 and 15 depend, either directly or indirectly on independent claim 1, and therefore are patentable at least for the reasons stated with respect to independent claim 1. Reconsideration and withdrawal of this art grounds of rejection is respectfully requested.

Claims 9, 10, 12-14 and 16

Claims 9, 10, 12-14 and 16 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Gyoda in view of von Gutfeld et al. (von Gutfeld) and Hashimoto. This rejection is respectfully traversed.

While not conceding the appropriateness of the Examiner's rejection, but merely to advance prosecution of the instant application, Applicants respectfully submit that independent claim 9 has been amended to recite a combination of elements in an apparatus for forming a liquid crystal layer on a substrate having a seal pattern, including a resonator overlapping the plurality of orifices for generating a vibration. The Applicants' respectfully submit that this combination of elements as recited in independent claim 9 is not disclosed or suggested by the art of record, including Gyoda, von Gutfeld and Hashimoto.

As explained above with respect to independent claim 1, piezoelectric element 59 of Gyoda, asserted by the Office Action to be a resonator, does not overlap a plurality of orifices. Neither von Gutfeld, nor Hashimoto can supply this deficiency. Therefore, a combination of Gyoda, von Gutfeld and Hashimoto cannot produce the Applicants' claimed invention as recited in independent claim 9.

In addition, claims 10, 12-14 and 16 depend, either directly or indirectly, from independent claim 9, and are therefore allowable based on their dependence from independent claim 9, which is believed to be allowable. Allowance of claims 10, 12-14 and 16 is respectfully requested.

Claims 7 and 8

Claims 7 and 8 stand rejected under 35 U.S.C. 103(a) as being unpatentable over von Gutfeld in view of Gyoda, and further in view of Masazumi. This rejection is respectfully traversed.

While not conceding the appropriateness of the Examiner's rejection, but merely to advance prosecution of the instant application, Applicants respectfully submit that claims 7 and 8 depend, either directly or indirectly on independent claim 1, and therefore are patentable for at least the reasons stated with respect to independent claim 1. Allowance of claims 7 and 8 is respectfully requested.

Conclusion

All the stated grounds of rejection have been properly traversed and/or rendered moot. Applicants therefore respectfully request that the Examiner reconsider all presently pending rejections and that they be withdrawn.

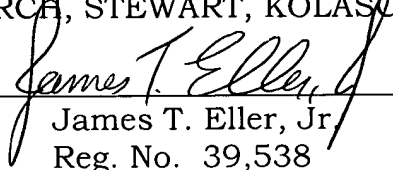
It is believed that a full and complete response has been made to the Office Action, and that as such, the Examiner is respectfully requested to send the application to Issue.

In the event there are any matters remaining in this application, the Examiner is invited to contact the undersigned at (703) 205-8000 in the Washington, D.C. area.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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